INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

20 September 2018 (am)

Subject ST9 – Enterprise Risk Management Specialist Technical

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

3. *You have 15 minutes of planning and reading time before the start of this examination. You may make separate notes or write on the exam paper but not in your answer booklet. Calculators are not to be used during the reading time. You will then have three hours to complete the paper.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all three questions, beginning your answer to each question on a new page.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

BLANK PAGE

1 Lotlot is a national lottery provider operating in a particular country. The prizes paid out by Lotlot are guaranteed in advance. Lotlot is a charity and has no shareholders. All profits are awarded to other charities in the country. It sells tickets only online and processes player payments, prizes and charity donations via the country's banking system. The majority of Lotlot's funds are invested in exchange-traded assets including equities and derivatives. The remainder are invested in short-term domestic government bonds.

The objective of Lotlot's investment strategy is to maximise profits.

(i) Discuss the appropriateness of Lotlot's investment strategy, given Lotlot's objective. [10]

Lotlot assesses the riskiness of its investment strategy using value at risk (VaR) and tail value at risk (TVaR). However, the country's financial regulator prefers to assess Lotlot's investment strategy using the probability of ruin.

(ii) Define the VaR, TVaR and probability of ruin. [5]

(iii) Describe the advantages and limitations of VaR and TVaR. [5]

(iv) Explain why the regulator is more concerned with the probability of ruin than the value at risk. [2]

(v) Suggest with reasons an appropriate time horizon for the probability of ruin. [2]

The regulator believes that Lotlot's probability of ruin is too high. It has asked Lotlot to take action to reduce the probability of ruin.

(vi) Suggest measures that Lotlot can take to reduce the probability of ruin without changing the range of assets it currently holds. [6]

The regulator is also concerned with the level of systematic risk that Lotlot faces.

(vii) Define systematic risk. [2]

(viii) Describe the sources of systematic risk to Lotlot. [4]

Lotlot's chief risk officer proposes that some investments be moved from equities into long-term corporate and government bonds to reduce the probability of ruin. An actuarial student in the chief risk officer's team suggests that this will also reduce Lotlot's systematic risk exposure.

(ix) Discuss this proposal and the actuarial student's assertion. [4]
[Total 40]

2 SunSeaSand Insurance Company ("SSSIC") is based in a particular country and sells travel insurance. The travel insurance pays out for:

- medical expenses;
- holiday cancellation; and
- lost luggage.

The policies are sold on two bases as follows:

- single trip – covering policyholders for one holiday;
- annual policies – covering all trips made in one year.

All policies are sold online. As such, SSSIC is particularly concerned about cyber risk.

(i) Define cyber risk. [2]

(ii) Explain the significance of cyber risk for SSSIC, giving two examples of cyber risk to which it might be exposed. [3]

(iii) Describe the information SSSIC would need to model cyber risk. [6]

(iv) Describe two actions SSSIC can take to reduce its exposure to cyber risk. [2]

The financial regulator is concerned about cyber risk and is considering adding it to the required risks to be modelled in the regulatory capital requirement calculation for insurance companies. It asks for data from a selection of companies operating in the same market as SSSIC. Each insurance company has provided the two statistics shown in the table below:

- minor instances threshold – a monetary amount of loss under which the event is not considered significant; and

- probability of no major loss in a year – the probability of losses due to cyber events NOT exceeding the threshold based on its own experience.

	Minor instances threshold	*Probability of no major loss*
SSSIC	£50m	0.9987
Flyaway Insurance	£70m	0.9635
Everyone Insurance	£60m	0.9821

(v) Explain why cyber risk may not be independent between the three insurance companies. [3]

The regulator assumes that the distributions of cyber risk losses are linked by a Gumbel copula with parameter $\alpha = 2$. The generator function for the Gumbel copula is $[-\ln(F(x))]^{\alpha}$.

(vi) Calculate the probability that none of the insurance companies suffer major cyber loss. [4]

(vii) Explain the limitations of the regulator's approach to quantifying cyber risk. [4]

(viii) Discuss an alternative approach SSSIC might use to model the risk of significant loss from cyber risk. [3]

The country's National Health Organisation is concerned about the lack of medical care which citizens receive abroad. It proposes that all citizens have a compulsory minimum level of medical cover in place on a travel insurance policy before they can travel abroad.

(ix) Explain the main upside and downside risks to SSSIC which might arise if the proposal were to go ahead. [6]

SSSIC is considering introducing a no claims discount on its policies whereby policyholders with fewer previous claims are offered discounts on their premiums.

(x) Discuss the advantages and disadvantages to SSSIC of a no claims discount system. [3]

[Total 36]

3 (i) Describe the three pillars of Basel II. [6]

BB Bank is a small local bank providing bank accounts, savings products and small loans to individuals. It has three branches in the same city, serving customers that live in the city and surrounding areas.

XYZ is a large national bank that provides bank accounts, savings accounts, mortgages, business and personal loans to individuals. XYZ has limited coverage in the city in which BB Bank is based. XYZ is considering buying BB Bank.

(ii) Explain the advantages to XYZ of BB Bank being Basel II compliant. [3]

(iii) Describe two risks to which BB bank has significant exposure for which XYZ bank's exposure is negligible. [2]

XYZ bank has an internally developed enterprise risk management (ERM) model, which it also uses for strategic decision making.

(iv) Explain how XYZ Bank can use an ERM model to help determine whether to buy BB bank. [9]

(v) Describe two key risk-adjusted metrics from the ERM model which are relevant for XYZ, explaining, for each, how it would be used. [4]

[Total 24]

END OF PAPER